

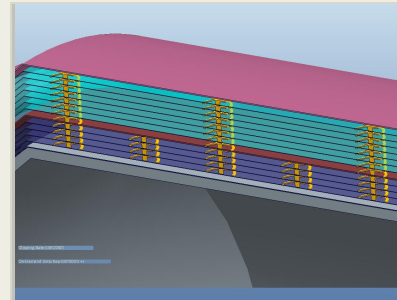
Integrated Launch Vehicle - Load Responsive MLI: High Performance during Launch Ascent, In-Air, On-Orbit and On-Mars, Phase I

Completed Technology Project (2015 - 2015)



Project Introduction

Human exploration requires new technologies for advanced in-space propulsion systems. Improvements in cryogenic propellant storage are a critical need. NASA's Technology Roadmaps call "Zero Boil Off storage of cryogenic propellants for long duration missions" the #2 technical challenge for future NASA missions. Quest Thermal has developed several innovative, advanced thermal insulation systems, offering high performance for specific applications such as on-orbit (IMLI), in-air (LRMLI) or launch ascent (Launch Vehicle MLI). Quest Thermal proposes to design and develop an innovative, multifunctional thermal insulation system for cryogenic propellants on launch vehicles operating during launch ascent, while on-orbit and when in-air/on-Mars surface. Launch Vehicle – Load Responsive MLI (LV-LRMLI) should provide unique properties, including ability to withstand direct exposure to aerodynamic free stream during ascent, high performance in-Mars atmosphere and very high performance in-space/on-orbit. A novel system integrating durable Launch Vehicle outer layers (for high performance on-orbit) with Load Responsive inner layers (for high performance in-Earth atmosphere and on-Mars), could withstand launch profiles and achieve both 0.5 W/m² on-orbit and 5 W/m² on-Mars surface performance goals. LV-LRMLI Phase I would review aerodynamic and aerothermal data and determine requirements. Structural/thermal modeling and analysis of LV-LRMLI will be done. Test fixtures will be designed and built that simulate launch loads. LV-LRMLI prototypes will be fabricated and tested with simulated aerodynamic loads and heat flux measured. This Phase I program would model, design, build and test a prototype LV-LRMLI system, validating aerodynamic durability and high thermal performance both on-orbit and in-Mars atmosphere, and demonstrating feasibility.



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Table of Contents

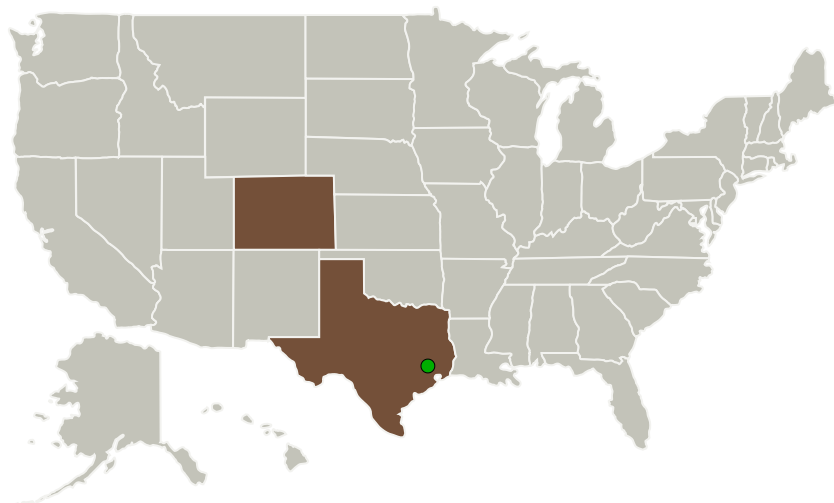
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Quest Thermal Group	Lead Organization	Industry	Arvada, Colorado
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations

Colorado	Texas
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Project Transitions

**June 2015:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Quest Thermal Group

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

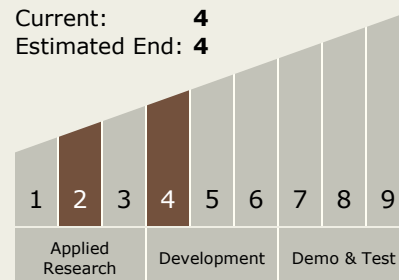
Carlos Torrez

Principal Investigator:

Scott A Dye

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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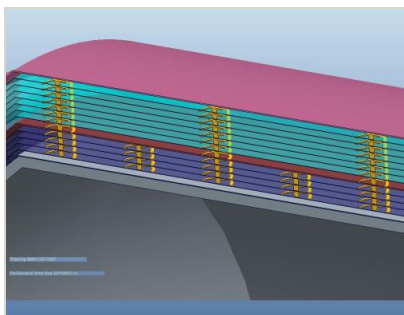
December 2015: Closed out

Closeout Summary: Integrated Launch Vehicle - Load Responsive MLI: High Performance during Launch Ascent, In-Air, On-Orbit and On-Mars, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139119>)

Images



Briefing Chart Image

Integrated Launch Vehicle - Load Responsive MLI: High Performance during Launch Ascent, In-Air, On-Orbit and On-Mars, Phase I
(<https://techport.nasa.gov/image/129452>)

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.2 Launch Vehicle Propellant

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System